

GCOS TECHNICAL SUPPORT PROJECT PACIFIC



Tarawa, Kiribati, Station Number 91610 - Training in new Proton Hydrogen Plant

QUARTERLY REPORT

APRIL - JUNE 2005

**METEOROLOGICAL SERVICE OF
NEW ZEALAND LIMITED**

3 August 2005

1 Executive Summary

This is the fourth Quarterly report of the GCOS Technical Support Project – Pacific (TSP) and marks the end of the Pacific Program for 2004-05.

Scheduled routine visits were completed to Tarawa and Funafuti GUAN stations. At Tarawa, a calibration and general check of the Proton hydrogen plant was undertaken, a new laptop PC was installed for the flight data computations and the set-up was changed to accommodate the higher burst heights expected after the imminent change to 700 gm balloons. We manufactured and installed a voltage protection device on the power circuit to the Proton hydrogen plant after power supply problems. After fitting the voltage protection device and repairing the unit a further power supply failure occurred. The component was again replaced and the plant is currently serviceable. As at Tarawa, calibration checks were completed and training provided.

Three small software developments were completed on MetService's systems to enable semi-automatic monitoring of Papua New Guinea GUAN and GSN station outputs, to refine our filtering system for erroneous or corrupt operational email messages, and to monitor GUAN termination heights in hPa. Most of the Pacific Island Countries operational messages are sent to MetService by email where the data is archived for operational use and transferred to the GTS. This should result in a slightly higher number of messages filing. As a result of monitoring termination heights of the GUAN stations in hPa, we have introduced new charts in Q4 showing average and maximum heights for each month. This enables a direct correlation of achieved performance with GCOS GUAN MRQs and TRQs.

Again, performance from Penrhyn and Funafuti remained excellent in Q4, although despite a number of attempts to freight balloons to Penrhyn ten flights were lost at the end of Q4 when the station stocks were exhausted. The program resumed early in July. Late and random changes to local shipping schedules and a tenuous, limited, air service contribute to re-supply difficulties. We are increasing our minimum stock holding. The performance from Tarawa is poor, mostly due to communication issues. Garry Clarke will be at Tarawa at the end of July to install a HF radio digital email system, which we hope will result in an improved performance.

The GSN inspection kits are at Tonga and Tuvalu, and Niue has just returned their kit after inspecting its GSN station. The meta-data, database has been constructed in Microsoft Access; in which data that results from the inspections will be filed.

Garry Clarke represented the Pacific TSP at a GCOS TSP co-ordination meeting held at Miami, Florida during May. We undertook the arrangements for the meeting. It proved a valuable exchange of information amongst the parties.

2 TSP Stations

The following stations are provided for under the TSP provisions.

Station Nr.	Station	Country	GSN	GUAN
91490	Christmas Is (Kiritimati)	Kiribati		
91610	Tarawa	Kiribati		
91701	Kanton	Kiribati		
91503	Munda	Solomon Islands		
91517	Honiara	Solomon Islands		
91554	Tekoa Airport, Santo	Vanuatu		
91568	Aneityum	Vanuatu		
91631	Nanumea	Tuvalu		
91643	Funafuti	Tuvalu		
91650	Rotuma	Fiji		
91652	Udu Point AWS	Fiji		
91680	Nadi	Fiji		
91699	Oni I Lau AWS	Fiji		
91724	Nukunonu	Tokelau Islands		
91780	Lupepau'u	Tonga		
91789	Nuku'alofa	Tonga		
91801	Penrhyn	Cook Islands		
91802	Penrhyn AWS	Cook Islands		
91812	Pukapuka AWS	Cook Islands		
91831	Aitutaki AWS	Cook Islands		
91843	Rarotonga	Cook Islands		
91824	Hanan Airport	Niue		
92014	Madang	Papua New Guinea		
92035	Port Moresby	Papua New Guinea		
92044	Momote	Papua New Guinea		
91960	Pitcairn Is	United Kingdom Territory		

3 GUAN Station Performance

3.1 Overview

The four operational stations supported under the TSP are Tarawa, Funafuti, Penrhyn and Port Moresby. For Tarawa and Funafuti, the routine operational expenditure is primarily provided by the Met Office. The Met Office also supports the staff costs at Penrhyn while the other station costs are met by funding from WMO VCP. We understand that this current VCP funding has now terminated and that GCOS has budgeted to take over component. Current reserves in this component should be sufficient to cover the period until at least the end of 2005. MetService contributes some technical and administration support. The TSP enables the technical assistance already allowed for to be enhanced. As Rarotonga may be of interest for future GUAN applications we have included some monitoring for this station but excluded any commentary on performance.

3.2 Tarawa Upper Air Program

The Tarawa upper air program continues to under-perform, especially in April and May. These are mostly day to day operational, management and financial issues which, as they are not technical, are difficult to resolve. The principal issue remains the communications arrangements. This is a combination of what we see as a fragile ISP service with outages as well as a severance of telecommunications services due to outstanding amounts owed. We suspect these outstanding amounts have accumulated as a result of staff not disconnecting from the ISP after sending traffic. There may also be virus software involved. During times when telecommunications were severed some staff would take the local bus to the Ministry Head Office some five kilometers away and use the fax there to send the messages. This posed downstream issues for entering the data on the GTS.

We have sought explanations for missing data when Garry Clarke has been in New Zealand but sometimes this has been impossible as all communications have been lost. Garry Clarke is traveling to Tarawa at the end of July to install the HF digital email system and configure it for the Bureau of Meteorology's system. This is now (mid July) running well in test mode. We believe that this will go a long way to resolving these issues.

The missing balloons and radiosondes of the shipment in late 2003 were finally collected in early April. They are operating satisfactorily.

3.3 Funafuti Upper Air Program

The program at Funafuti operated well during the quarter. There remains an issue with the Proton power supply. During the quarter we visited the station and installed the voltage "under/over" protective device in the power supply circuit. We then installed a new power supply only to have it again fail. This, to us, suggests that there is a continuing fault in the power supply units. Again, we are resolving with Proton.

The HF digital email system was reconfigured to a Bureau of Meteorology system that it is installing for the receipt of meteorological messages. Late in June when the local ISP failed totally we talked Funafuti through reconfiguring it back to a "sailmail" protocol to enable upper air traffic to be sent. This is working well and upper air messages are being received, although some delays are being experienced. The Bureau of Meteorology system is expected to be commissioned in July.

3.4 Penrhyn Upper Air Program

The equipment at Penrhyn and the performance of the technician remain excellent. However, there was an outage of 10 days in June as a result of the station running out of balloons. We expected a consignment of balloons to be shipped on the May vessel but this did not occur. Shipping supplies to Penrhyn is difficult as all goods are cleared through Customs at Rarotonga and trans-shipped on a local vessel. We have arranged for the Cook Islands Meteorological Service at Rarotonga to uplift goods and re-consign them on the local vessel. This usually ensures that goods do not get forgotten in the back of a wharf store at Rarotonga. A significant issue is the erratic scheduling of the vessel, serviceability and late changes to its movements. The weekly aircraft is a small Embraer Bandeirante that is very freight restricted. We did airfreight 20 balloons to the Cook Islands Meteorological Service to on forward by airfreight as an interim supply. These were uplifted at Rarotonga two days before the flight to Penrhyn but were not consigned on the flight. To minimize future disruptions due to re-supply we are increasing our stock holding at Penrhyn.

We are making progress with the issue of spare thyratrons and have sourced an alternative adaptor that fits the valve base after the manufacturer of the thyatron required that we purchase a large number to make it worth their while making a batch of these obsolete components.

One flight was not received in May due to the technician recovering radiosondes from the local ship. Ten flights were missed in June as a result of the depletion of balloon stocks. Of all flights received during the quarter only six did not exceed 10hPa.

There is no change to the status of the draft MOU that Steve Palmer and Tony Veitch presented to the Cook Islands. There remains the land lease issue but after discussing with Garry Clarke, who appears to have been the last Officer in Charge at Rarotonga in the early-mid 1980s that had the document approving the occupancy of the land at Penrhyn extended, we do not believe there was any monetary arrangement. We do not plan to pursue this unless it becomes an issue for the program.

No issues were experienced with the Proton.

3.5 Rarotonga Upper Air Program

A fire in the electrical distribution board in the equipment room of the radar facility caused extensive damage to the interior and surrounding cables and components. It would seem that the radar is recoverable but will require fairly extensive restoration. The Cook Islands has requested we assist and we are in the process of obtaining funding support through NZAID for a technical survey.

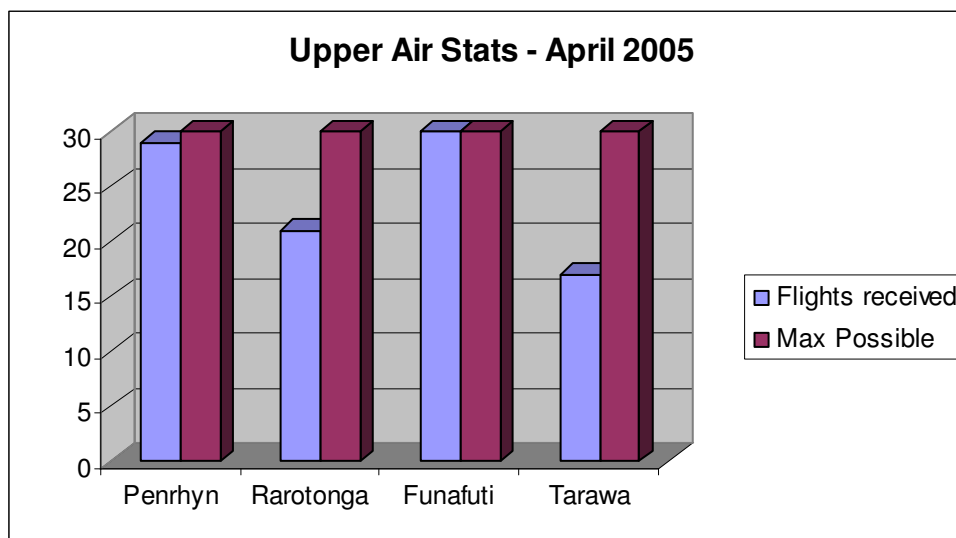
Contingent on the findings we will plan a restoration project and request further NZAID assistance. In the meantime we have loaned a pilot balloon theodolite and low level, visual wind measurements have commenced.

3.5 Upper Air Statistics

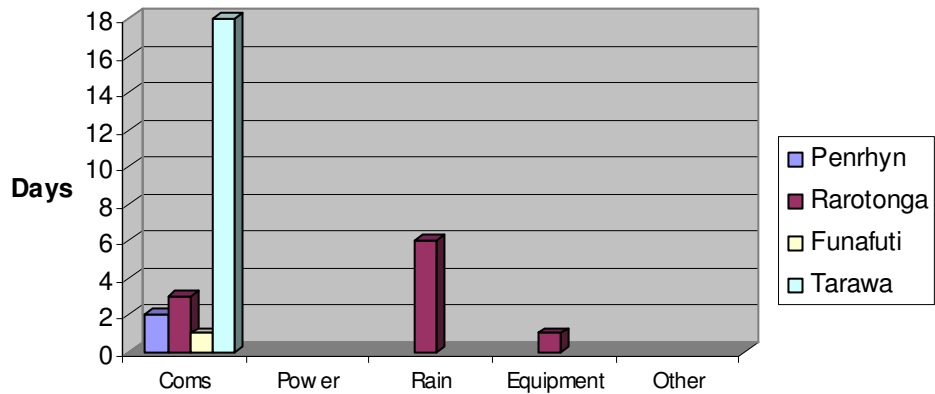
The charts are largely self-explanatory.

The “Problems” chart provides a breakdown of areas in which problems occurred at the stations. The "Other" category encompasses occasions when no information has been provided from the station and we have been unsuccessful in discovering the reason. It is also used for depleted stores. The “Rain” category applies to radar wind finding and signal loss due to strong rain echoes.

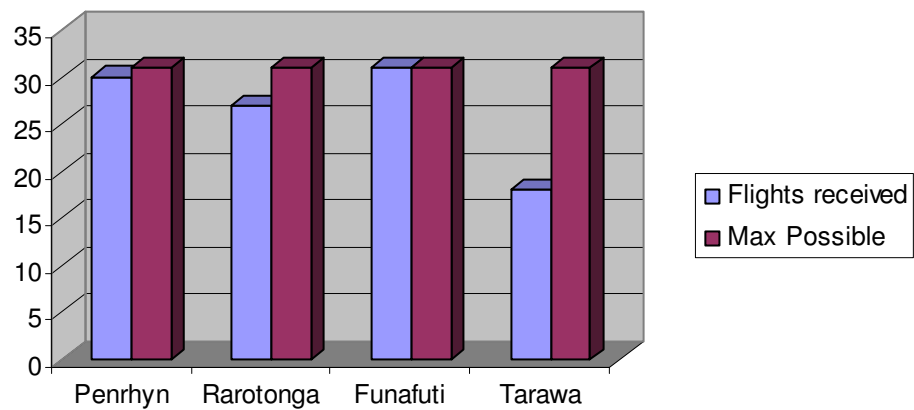
A new series of charts has been added this quarter. We have started monitoring the average and maximum termination heights in hPa for all stations. Port Moresby is included in the monitoring but not in the graphs in Q4. There were very few radiosonde flights completed and we suspect they are out of stock. Some pilot balloon flights were completed. 100 hPa is the GCOS MRQ and 5 hPa is the TRQ. We expect to see some fluctuation in the “average” line as only a few early terminations for such reasons as radiosonde failure or an early burst can distort the results noticeably. The long term trend, when this is established, will provide a better performance indication. Penrhyn is operating 700 gm balloons, whereas Tarawa and Funafuti are finishing the last of their 350 gm balloons before also operating 700 gm balloons. This accounts, mostly, for the higher terminations at Penrhyn. We believe that there is also a station latitude and seasonal effect of balloon bursts. Higher bursts are often evident at lower latitudes.



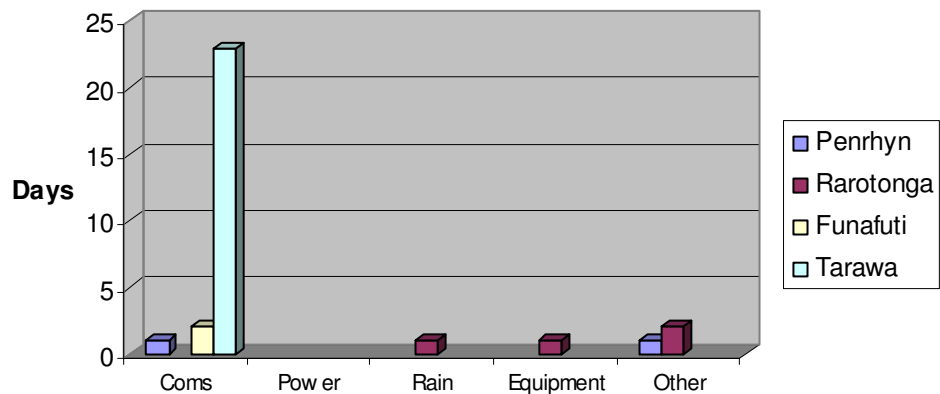
Upper Air Stats - April 2005 Problems

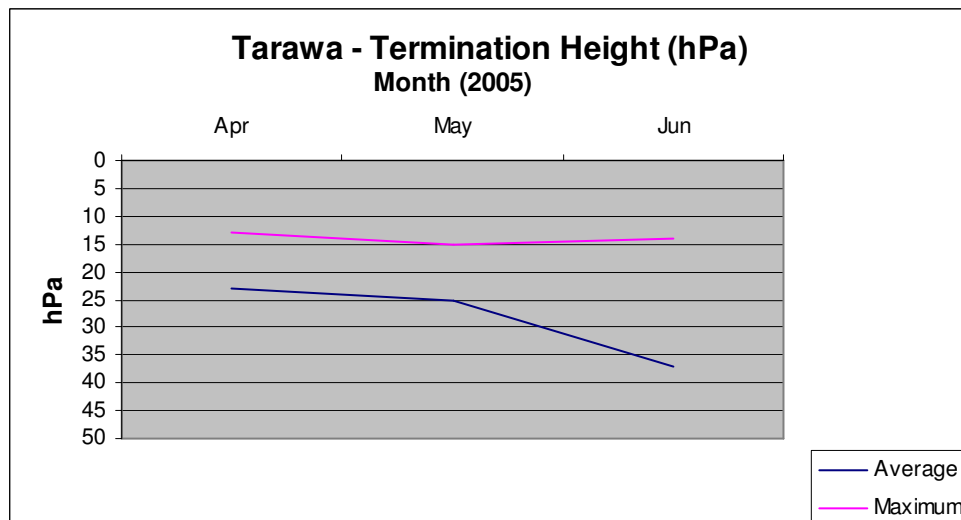
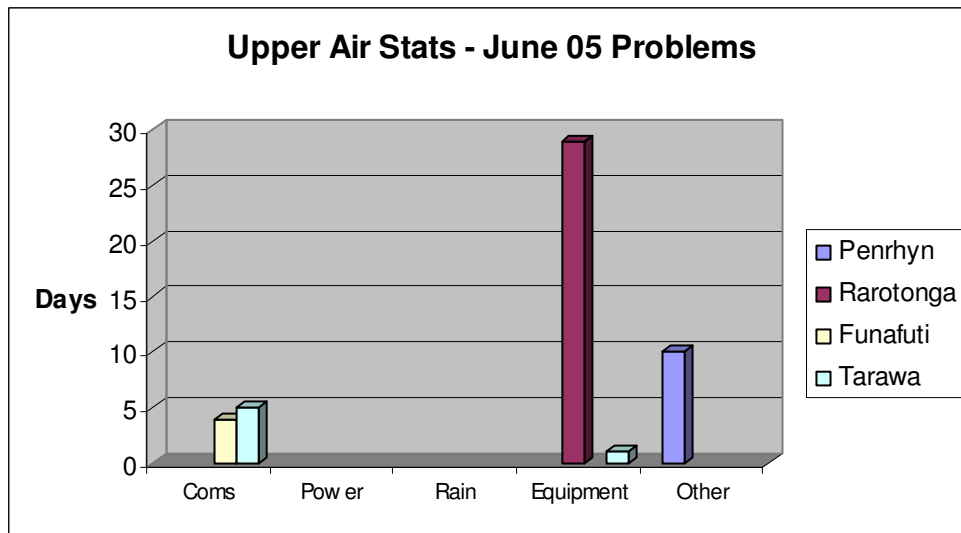
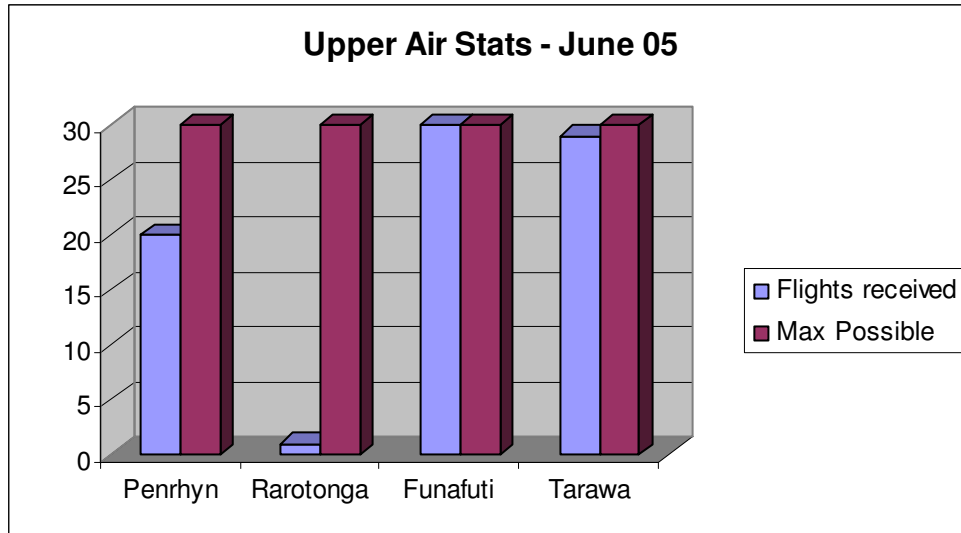


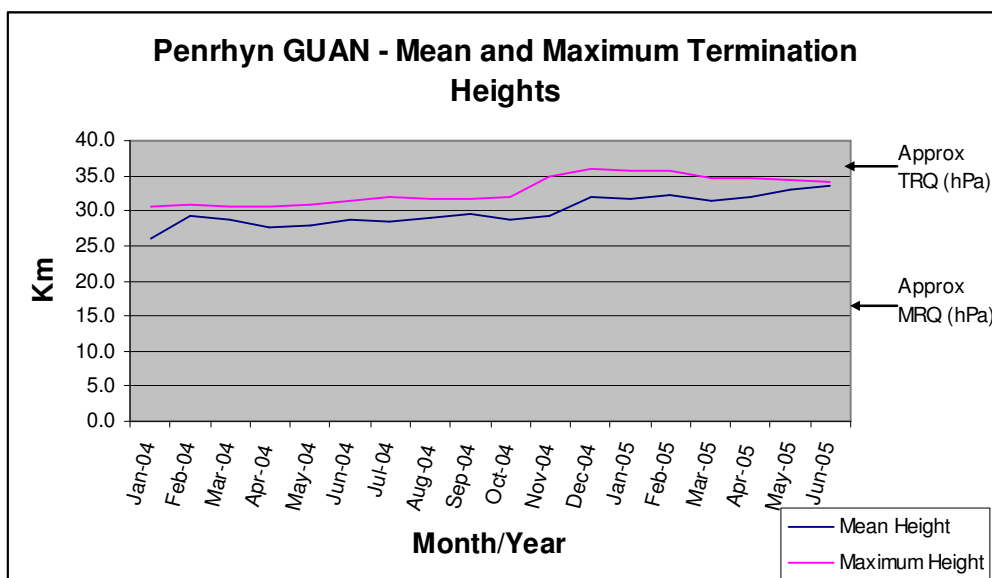
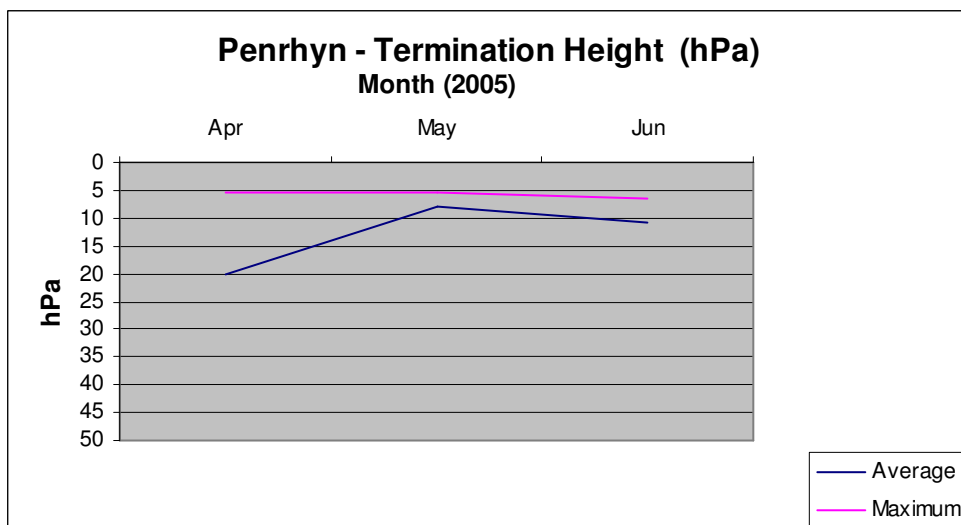
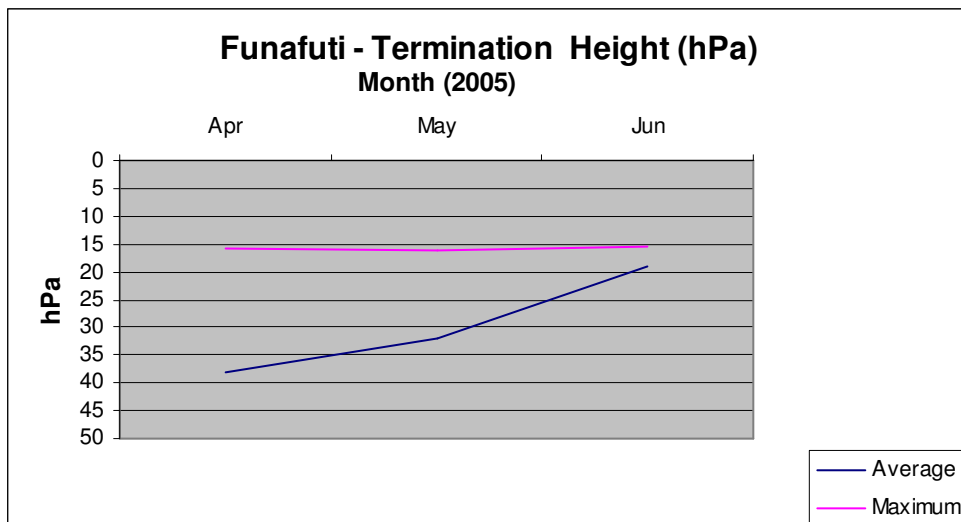
Upper Air Stats - May 05



Upper Air Stats - May 05 Problems







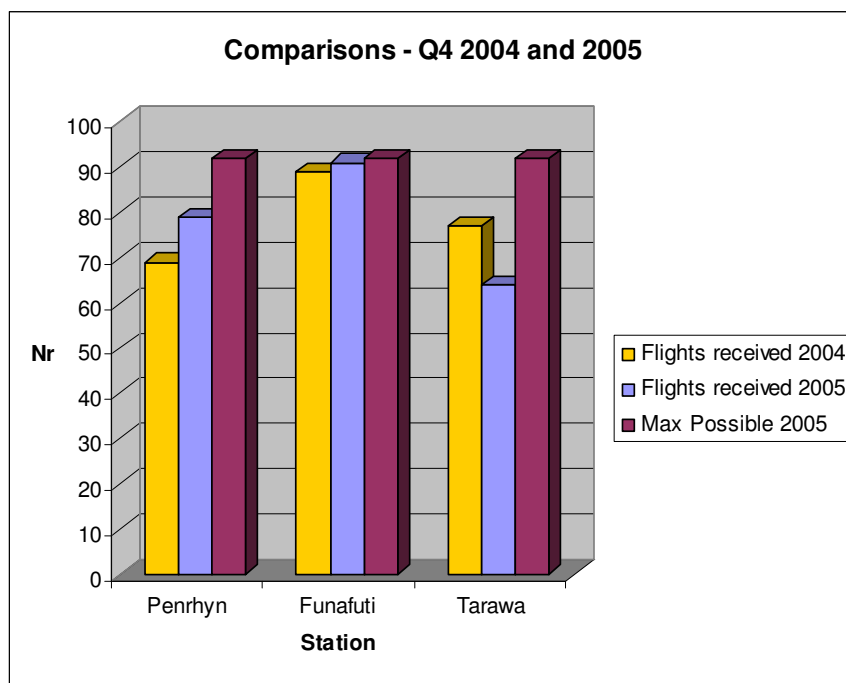
Note: Rarotonga is not currently a GUAN station and does not receive support under the TSP provisions.

- GCOS GUAN – Target Requirement (TRQ) = 5 hPa;
Minimum Requirement (MRQ) = 100 hPa.

3.6 Climate Temp Messages

Climate Temp messages are produced for Tarawa, Funafuti and Penrhyn. We are unclear whether Port Moresby is producing a message but we assume that would be the case.

3.7 Comparison of 2003 and 2004 Results



4 GSN Station Performance

4.1 Overview

Synoptic reports from GSN stations provide the input to enable the end of month Climate Message to be constructed for each station. Our focus to date has been on the GUAN program – consistent with the GCOS priorities as we understand them.

4.2 GSN Station – Missing Synoptic Reports

The chart shows the number of missing synoptic reports from the region's GSN stations that are passed through MetService's gateway or currently monitored by MetService.

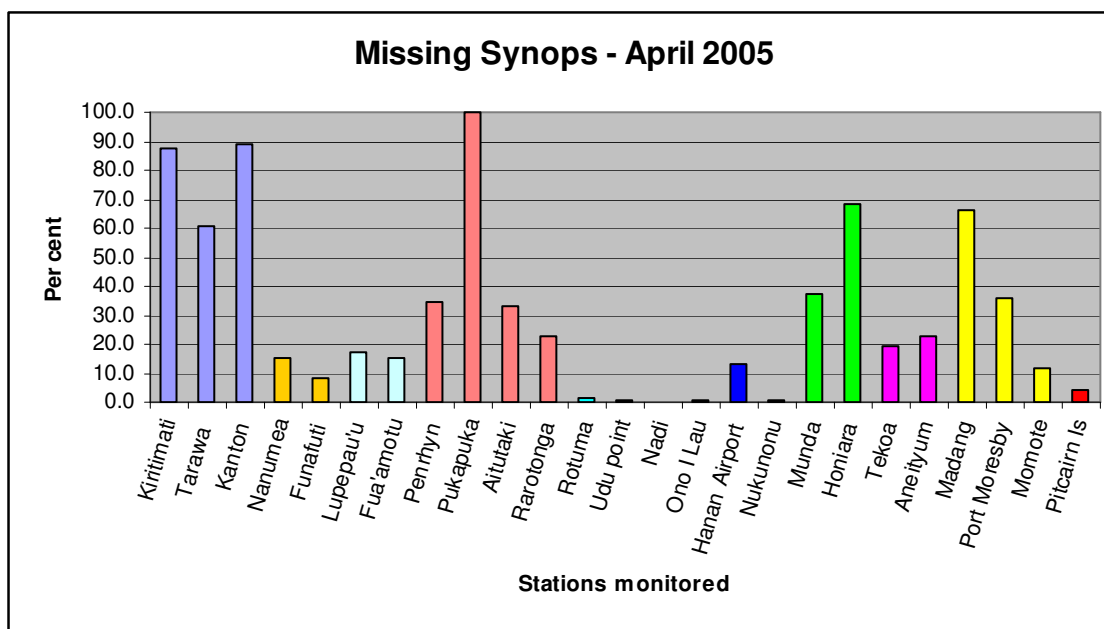
This quarter we have initiated monitoring of the Papua New Guinea stations.

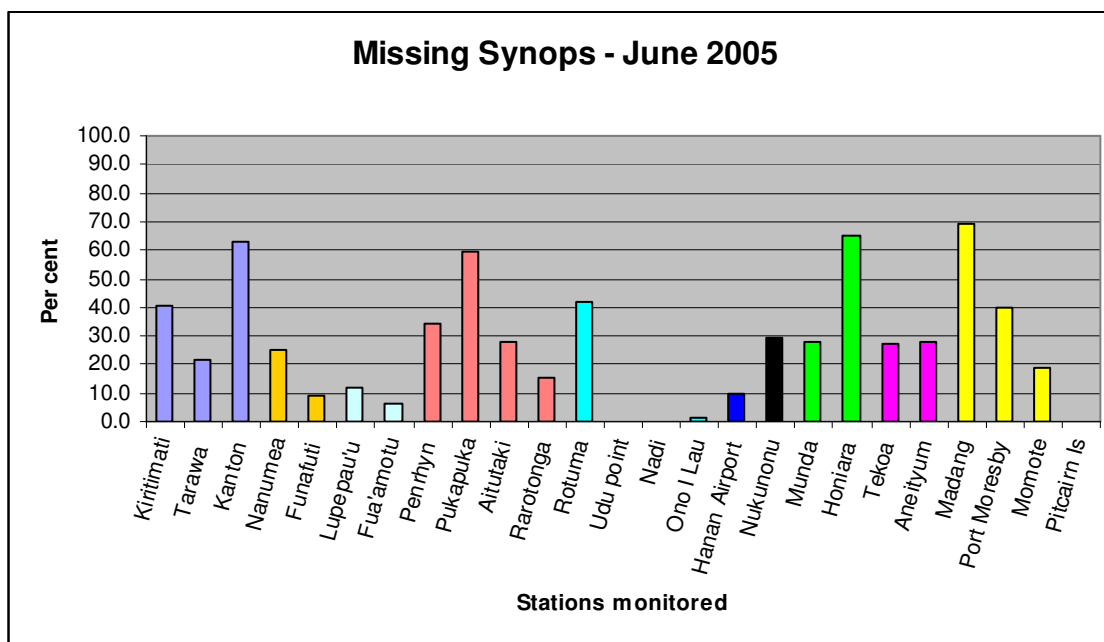
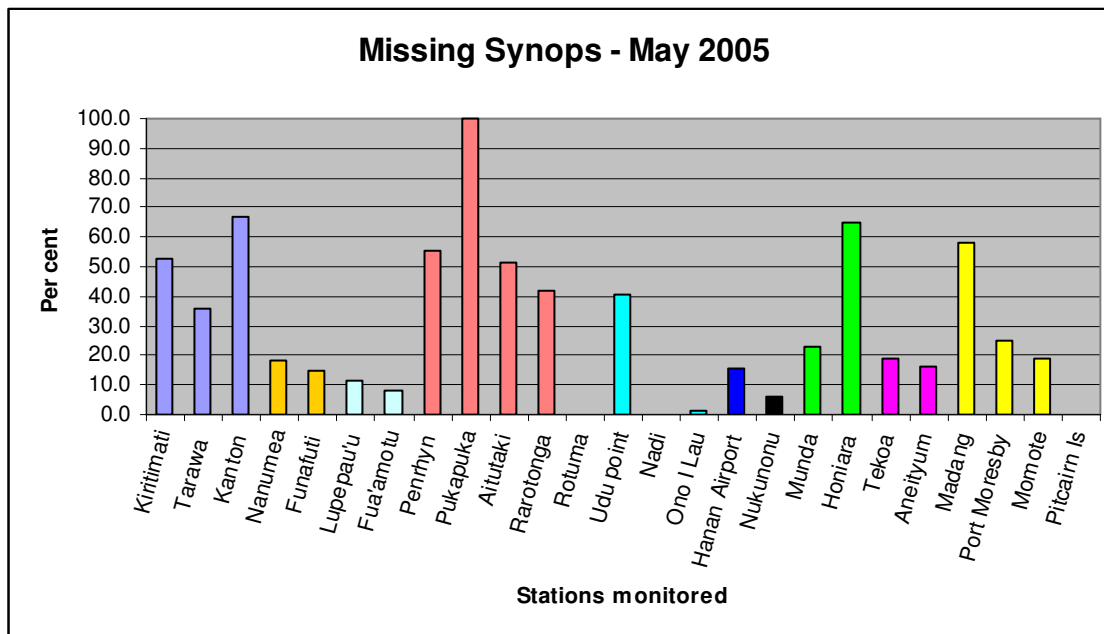
It does not take account of:

- Reports that may have been received by the Meteorological Services' Head Offices but not on-forwarded to MetService.
- Reports that may have been rejected due to incorrect bulletin headers.

The total number of synoptic reports possible is determined from WMO Tables showing each stations reporting program. Where it seems that the advised reporting program is not up to date, as far as practicable, we will adjust total number of synoptic reports used in the calculation.

Stations are "colour coded" according to country.





5 Project activity

5.1 GUAN Routine Maintenance

Routine maintenance visits to Tarawa and Funafuti were completed under the TSP provisions in Q4.

5.5.1 Tarawa

Proton Hogen 20

The safety hydrogen detection sensor was calibrated using standard 2% H₂ gas. A warning code was displayed the next day indicating calibration drift so calibration was performed again as per factory instructions.

The local staff had previously reported errors associated with the mains power supply. No problems with the Proton were observed during the engineer's stay however the mains voltage varied from day to day. Some days it was stable at 238Vac, while on other days it showed unstable readings of up to 263Vac. A contractor, who works on the Island generators, advised that the local Betio generator had recently failed and was still under repair. Power was being routed via one of three generators at the Airport end of the Island. In addition to this, new underground cables were being installed and a new generator was expected to be commissioned by December. Frequent power cuts are to be expected as this work is completed. The local engineer was asked to keep an eye on the mains voltage and to avoid using the Proton if it was excessively high.

The earthing system and filling hose were checked.

Minor surface rust spots on the Hydrogen tanks were touched up with Zinc paint, otherwise these are in excellent condition.

Digicora

The set-up configuration was changed to accommodate the expected higher terminations when the 700 gm balloons are introduced, the same adjustments that have already been made for Funafuti & Penrhyn Digicora systems.

The flight data ingest Win 98 PC was becoming very unreliable (floppy drive unserviceable) so this was replaced with a laptop running PC winds. Staff were trained on new procedure to save archived flight TEMP data to a removable USB drive. This will then be transferred to another PC to format correct messages and email to MetService at Wellington.

The Solar Power Battery Back-up system failed due to the battery being low on water. This was topped up and it resumed its charge satisfactorily.

Vaisala Surface Wind Display

The office WAD21 display is operating for wind speed only. The mast WAT11 data sender tested satisfactorily at its direction inputs indicating the fault is associated with the WAV wind vane sensor or possibly the cables leading to it. A spare but unserviceable wind vane (S/N P35503) was returned to Paraparaumu

Engineering Workshops for repair. The local engineer has already replaced the bearings and will re-install this sensor when unit is returned.

Recommendations

General

The outside Digicora backup battery has been tampered with. Hinges and lockable latch should be installed on its wooden box lid.

To improve security the new XP laptop could have its user login privileges restricted (ie. no software installs) and have an administrator login/password for MetService engineers use only.

During a power cut, the local staff moved the station barometer (PA11) so it can be powered from the mains battery inverter. These are very fragile sensors so this increases risk of damage. This low drain device could easily be backed up by a small 12V Gell Cell (say 7A/hr). The sensor could then be mounted in its purpose built fixed cradle for increased security. The unit should also be spot checked by a PA.

Proton Hogen 20

- UVR automatic voltage cut out system for poor mains stability conditions (As has been supplied at Penrhyn & Funafuti).
- Standard garden hose water pre-filter cartridge for Aqua de-ionizer; (some algae lumps are getting through to the carbon filter)
- Auto mains shut-off at tank fill system as used at Raoul Island; (the local staff tend to forget to switch the unit off in the afternoon)

5.5.2 Funafuti

Proton Hogen 20

Prior to the maintenance visit, the Funafuti staff had advised that the generator was unserviceable, as the stack power supply had failed again. The spare supply, from the TSP spares pool, was air freighted to them, with a request not to install it before the engineer arrived. After discussions with Proton, an over voltage / under voltage relay unit was manufactured, and taken up.

On arrival it was found that it was the 24 V power supply that had failed, not the stack supply. This was replaced using the station spare, and the relay unit was fitted. The generator then started up normally, however over the next couple of days, there were a number of shut downs, with a system pressure low error

advised. The cause of this was eventually found to be a valve spring incorrectly installed in the gas dryer.

On the third day, the stack power supply failed. The engineer was in the office at the time and there was no evidence of any mains supply interruption; ie. no brown outs, flickering lights, etc. No other electronic equipment on the station was affected, and the over voltage / under voltage relay did not trip. The power supply was replaced and no further problems were experienced.

Some time was spent on refresher training with the local staff, particularly in completing the combustible gas detector calibration.

Digicora

While functional, this had some minor problems. Sometimes it would not communicate with the MetGraph computer. This was resolved by using more appropriate connectors on the PC ports. The original connectors had been changed at some time, and were too wide, preventing the connectors from being plugged in squarely. The GPS card intermittently produced a non-fatal warning at startup and had an excessively long acquisition time. This was not able to be repaired on site and will be replaced with spare from TSP pool.

Follow ups

- Stack power supply – has been returned to Proton for repair / exchange.
- 24 V power supply. The manufacturer advised it was unable to be repaired and we purchased a replacement.
- Digicora GPS card. The advice from Vaisala on the error code is that the fault is easily repairable in workshop.

5.2 GUAN Fault Maintenance

A number of activities have been in progress during Q4 to provide remote fault assistance to the GUAN stations.

Two problems occurred at Funafuti before the routine visit on the Proton and Digicora. These involved remote diagnosis of faults and, where possible, suggestions to rectify the fault. The faults have been reported on in the previous section.

Late in Q4, Port Moresby asked for assistance for a fault on their Teledyne hydrogen generator. We assisted with the correct diagnosis, contacted the U.S. manufacturer and arranged for the part to be provided.

We sourced an alternative thyatron base for the unit that is fitted to the radar at Penrhyn after the thyatron manufacturer required a large order of bases to do a production run.

Following the in-country work for the Honiara GUAN survey, we recovered the Digicora to our Engineering Workshops and spent two days diagnosing the faults on the system that we were unable to complete when we were in-country. An added complication was that the Digicora had been dropped heavily in transit and the casing was cracked and components jarred from their fittings. We are pursuing this through MetService's insurer. Fortunately, the damage proved to be superficial and will cost about USD 2,600 to repair.

5.3 GUAN Ground Equipment consumables

As reported previously, we have been unable to obtain a base adaptor from the supplier and are seeking alternatives. Progress in being made. One thyatron has been supplied and is brought to charge in Q4.

5.4 GUAN Technical Spares

A further power supply unit from the Depot Spares kit was freighted to Funafuti in Q4. Freight associated with this was costed to the TSP. We replaced the ground equipment printer at Port Moresby while in-country – see Port Moresby report summary. This was brought to charge in Q4. Some minor components were purchased to enable the diagnosis of the faults on the Digicora from Honiara to proceed. We are reviewing the budget requirements to replenish the kit and this will be completed under the 200506 TSP program.

5.5 GUAN Country Reimbursement

Only minor costs are accommodated and for the presently assisted stations all reasonable in-country operating costs are provisioned.

5.6 GSN Station Inspectors Kits

This TSP component has been completed.

5.7 GSN Stations Training Course

No activity in this component in Q4. As reported in Q3, subject to the approval of the GCOS Secretariat, we will look at undertaking in-country CLIREP training where required as part of the 200506 work program. This is also subject to available budget.

5.8 GSN Stations Inspections

The kits were despatched to Niue, Tonga and Tuvalu as the first countries for the inspection of their GSN stations in Q3. Niue has completed its inspection and has returned the kit to Paraparaumu Workshops for overhaul prior to its dispatch to the next country. Tuvalu is in the process of inspecting its stations, including the remote ones involving ship travel, and we have supplied funds for internal travel costs to enable Tonga to inspect GSN station Lupepau'u. Both Tuvalu and Tonga have requested that they also use the kit to inspect their other meteorological reporting stations. We have agreed to this, provided travel costs are not costed to the TSP.

Some Directors attending the 10th Regional Meteorological Services Director's meeting at Niue in April advised that a training course was needed in using the kit. Garry Clarke provided some training at the Melbourne Climate Data base Workshop last December to participants. The instructions accompanying each kit are comprehensive and, we believe, quite clear. We do not believe a detailed training course is needed.

We noted Danny Foster's valid point that his approach in the Caribbean TSP would be to undertake the inspections himself. For some Pacific countries we think this would be a better and more expeditious approach. However, there are difficulties in-so-far as some GSN stations can only be reached by a lengthy sea voyage, which is problematic in terms of staff time. These inspections, we think, could only be completed by country meteorological staff. However, we are thinking that if we visit countries for other reasons and there is an opportunity to complete an inspection and provide hand-on training as part of this, then we will do this. We will also only leave the kit with countries for a reasonable time to enable inspections to be completed, after which we will ask that kit be returned, regardless of the inspections actually undertaken.

5.9 Reserves

There have been no requirements to date.

5.10 Program management and administration

During Q4 we completed work to monitor the termination heights in hPa of the active GUAN stations, and to add Papua New Guinea GUAN and GSN stations to the monitoring program. The outcomes are shown in the GUAN and GSN station performance graphs of this report. While we are monitoring Port Moresby GUAN, we have not included the results in the charts as, with the exception of five radiosonde flights in April, we only received what we suspect were pilot balloon flights and about 50% flight days each month of the total possible. There have been hydrogen generator problems at Port Moresby towards the end of the period, but we

suspect that the supply of radiosondes that were kindly supplied by the Bureau of Meteorology is exhausted.

Programming was also completed to refine our email message filter. We expect this will result in slightly higher message ingest rates.

The meta-data system, in which station meta-data will be entered, has been constructed.

We completed the travel and meeting logistics for the Miami GCOS TSP Coordination meeting. Garry Clarke represented the Pacific – TSP at the meeting.

Some remote advice and assistance has been provided by Garry Clarke on the CLIREP software but as advised in Q3, we believe a training course as well as in-country assistance will be required to establish an operational program in a country.

Routine program control of activities, coordination, financial planning, management, reporting and administration was undertaken during the quarter.

5.9 Honiara GUAN Technical Survey

We have twice requested Solomon Islands Meteorological Service a response for information needed to complete the survey costings and report. We are wondering if there is an email issue and plan to shortly write to the Director and Permanent Secretary for the necessary information. Indicative costs have been provided to the GCOS Secretariat.

6 Project Activity Planned for Next Quarter

- Plan and budget the 2005-06 TSP work programme.
- Routine support and assistance for GUAN and GSN stations.
- Replenish the TSP spares kit
- Decide on what upper air systems to use at GCOS funded stations.
- Receive back the TSP kits from Tonga and Tuvalu, recalibrate instruments, extract meta-data and enter in database, restock the kits and send to the next TSP countries.
- Provide the Honiara GUAN site survey reports.

7 Financials

Under separate cover to TSP stakeholders.

8 Report Distribution

- Mr Henry Taiki
WMO Program Officer
WMO Sub-regional Office for the South West Pacific
- Mr Richard K. Thigpen
GCOS Implementation Manager
WMO
- Mr Howard J. Diamond
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